

**REMARKS**

The Examiner requested a substitute specification for correcting grammar and to improve clarity. Accordingly, the Applicants have enclosed both marked-up and clean versions of a substitute Specification and Abstract (pages 1-7 and 10) in which the grammar has been corrected throughout the Specification and Abstract. In addition, typographical errors have been corrected, for example, errors in the reference numerals. No new matter is introduced. The claims are omitted from the substitute Specification in view that the claims are amended in the present Amendment.

The Examiner's objections to the drawings under 37 C.F.R. 1.83(a) have been addressed by the cancellation of Claims 3 and 4.

Claims 1-5 are pending in the application. In the Office Action at hand, Claims 1 and 3-5 are rejected and Claim 2 is objected to.

In particular, Claims 3 and 4 are rejected under 35 U.S.C. § 112, first paragraph. In addition, Claims 1 and 5 are rejected under 35 U.S.C. § 102(b) as being anticipated by US 5,808,592 (Mizutani).

The Examiner noted that Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Accordingly, the Applicants have amended Claim 1 to include the limitations of Claim 2. Therefore, Claim 1, as amended, is now in condition for allowance. Reconsideration is respectfully requested.

In addition, the Examiner's § 112 rejections of Claims 3 and 4 have been overcome by the cancellation of Claims 3 and 4.

Furthermore, with Claim 1, as amended, being in condition for allowance, it follows that Claim 5, being dependent upon Claim 1, is also in condition for allowance.

**CONCLUSION**

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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## LIGHT EMITTING DIODE ASSEMBLY FOR AN ILLUMINATED SIGN

### RELATED APPLICATION(S)

This application claims priority under 35 U.S.C. § 119 or 365 to Korean, Application No. 2003-14096, filed May 7, 2003 and Korean Application No. 2003-  
5 21010, filed April 3, 2003. The entire teachings of the above application(s) are incorporated herein by reference.

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The prevent invention relates to a Light Emitting Diodes (LED), and more  
10 particularly to a light emitting diode assembly for an illuminated sign, which can be used as LED modules for various illuminating applications, such as a commercial sign, a street sign, a channel letter sign, etc.

#### 2. Description of the Related Art

Since Light Emitting Diodes (LED) [[has a]] have relatively low maintenance  
15 costs, a relatively high reliability and a relatively long lifetime, [[it has]] they have been used in many applications to replace a conventional incandescent lamp, a fluorescent lamp, a neon tube and fiber optic light sources.

Compared to a conventional light source, an LED consumes [[a]] relatively little electrical energy while exhibiting a much longer life-time, and many LED designs are

now being developed specifically for applications such as for channel letter ~~[[sign]]~~  
signs utilizing ~~[[LED]]~~ LEDs.

One type of ~~[[the]]~~ a light emitting diode module for an illuminated sign has  
been proposed, Light Emitting Diode Modules for Illuminated Sign, in U. S. Patent No.  
5 6,568,021 issued to Chen H. Wu on May 6, 2003. However, conventional Light  
Emitting Diode Modules may be used in Damp and Dry environments instead of wet  
environments. Accordingly, the confidence of the constitutional parts ~~[[of]]~~ thereof  
deteriorates because water penetrates into the inside ~~[[of]]~~ thereof. Also, ~~[[the]]~~ Light  
Emitting Diode Modules, ~~which is~~ exposed to the outside from a case, ~~becomes~~ become  
10 fragile against ~~[[an]]~~ outside impact. Also, a connecting wire may be frequently short.

#### SUMMARY OF THE INVENTION

The present invention solves the foregoing problems. It is an object of the  
present invention to provide a light emitting diode assembly for an illuminated sign,  
which has an enhanced waterproof function and an enhanced durability.

15 It is another object of the present invention to provide a light emitting diode  
assembly for an illuminated sign with the design, which has a function of preventing a  
wire from shorting.

In order to achieve the above objects, the present invention provides a light  
emitting diode assembly for an illuminated sign, the light emitting diode assembly  
20 comprising:

a case being open upwards, in which a connecting recess is formed on upper  
portions of both sides of the case;

a printed circuit board being installed in the case and being mounted on upper  
sides of a plurality of light emitting diodes;

25 a hollow cap being coupled in the connecting recess of the case, in which a  
plurality of wires pass through the cap; and

a synthetic resin material for covering the printed circuit board, the cap and the  
light emitting diode, the synthetic resin material being filled in the case.

The printed circuit board includes a transformer, a rectified circuit, a constant voltage circuit and a constant current circuit, in which the transformer drops the voltage so that a common alternating current supplied through the wires ~~[[are]]~~ is coincided with or converted to a driving voltage of the light emitting diode, in which the rectified

5 circuit transforms the alternating current to direct current voltage, and the constant voltage circuit and the constant current circuit adjust ~~[[a]]~~ the intensity of a direct voltage supplied through the ~~[[wire]]~~ wires so that the direct voltage is coincided with or converted to the driving voltage of the light emitting diode.

The printed circuit board includes a constant voltage circuit and a constant

10 current circuit for adjusting the intensity of a direct voltage supplied through the ~~[[wire]]~~ wires in order to harmonize the direct voltage with the driving voltage of the light emitting diode.

As described above, in the light emitting diode assembly for an illuminated sign according to the preferred embodiment of the present invention, ~~[[The]]~~ the light

15 emitting diode assembly includes a case being open upwards. The printed circuit board is installed in the case and ~~[[being]]~~ is mounted on upper sides of a plurality of light emitting diodes. The hollow cap is coupled in the connecting recess of the case. In this structure, the light emitting diode assembly can prevent the printed circuit board, transformer and the light emitting diode from being damaged by using an epoxy resin.

## 20 BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other characteristics and advantages of the present invention will become more apparent by describing in detail-preferred embodiments thereof with reference to the attached drawings, in which:

FIG.1 is ~~an exploded~~ a view of the light emitting diode assembly for an

25 illuminated sign according to a preferred embodiment of the present invention.

FIG. 2 is an exploded view of the light emitting diode assembly for an illuminated sign according to the preferred embodiment of the present invention, ~~[[for]]~~ showing an installed state thereof.

FIG. 3 is a sectional view taken along line A - A of FIG. 2; and

FIG. 4 is ~~an exploded~~ a view of the light emitting diode assembly for an illuminated sign of FIG. 1, ~~[[for]]~~ showing an application thereof.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 Hereinafter, the light emitting diode assembly for an illuminated sign according to a preferred embodiment of the present invention will be explained in more detail with reference to the accompanying drawings.

FIG. 1 shows an exploded state of the light emitting diode assembly for an illuminated sign according to the preferred embodiment of the present invention.

10 Referring to FIG. 1, the light emitting diode assembly 100 is disposed on an illuminated sign 104.

Referring to FIG. 1, the light emitting diode assembly 100 has a case 110. A receiving chamber is formed ~~[[at]]~~ in the case 114 and upwardly ~~opened~~ open. A coupling recess ~~[[132]]~~ 112 is formed at upper portions of both of the outside walls of the case 114. Preferably, the coupling recess ~~[[132]]~~ 112 has a semi-circular shape. A connecting bracket 116 protrudes from lower ends of both sides of the case 110 in ~~[[an]]~~ opposite ~~direction~~ directions. A screw recess 117 is formed ~~[[at]]~~ in the connecting bracket 116.

The printed circuit board 120 includes a transformer 140, a rectified circuit, a constant voltage circuit and a constant current circuit. The transformer 140 drops the voltage, and thereby common alternating current supplied from the ~~[[wire]]~~ wires 102 are coincided with or converted to the driving voltage of the light emitting diode 122. The rectified circuit adjusts alternating current to direct current voltage. The constant voltage circuit and the constant current circuit adjust a direct voltage ~~supplying~~ supplied from the ~~[[wire]]~~ wires so that the direct voltage is coincided with or converted to the driving voltage of the light emitting diode 122.

Also, the printed circuit board 120 includes the constant voltage circuit and the constant current circuit for adjusting a direct voltage supplying from the ~~[[wire]]~~ wires

in order to harmonize the direct voltage with the driving voltage of the light emitting diode 122.

A printed circuit board 120 is installed in the case 110. A plurality of light emitting diodes ~~[[100 is]]~~ 112 are mounted on an upper side of the printed circuit board 120. The printed circuit board 120 includes a transformer 140, a rectified circuit, a constant voltage circuit and a constant current circuit. The transformer 140 drops the voltage so that a common alternating current supplied through the wires 102 ~~[[are]]~~ is coincided with or converted to a driving voltage of the light emitting diode 122. The rectified circuit transforms the alternating current to direct current voltage. The constant voltage circuit and the constant current circuit adjust a intensity of a direct voltage supplied through the ~~[[wire]]~~ wires so that the direct voltage is coincided with or converted to the driving voltage of the light emitting diode 122.

A plurality of caps 130 ~~[[is]]~~ are inserted into a coupling groove ~~[[132]]~~ 112 of the case 110, respectively. An upper portion of the cap 130 is formed as a linear line, and a lower thereof is formed as a semicircular shape corresponding to the coupling groove ~~[[132]]~~ 112 of the case 110. A plurality of wires 102 perpendicularly ~~passes~~ pass through the center portion of the cap 130. The coupling groove 132 is formed at a lower edge of the cap 130, which is inserted into the connecting recess 112 of the case 110. A pair of guiding pipes 134 ~~for passing through the wire 102~~ protrude outwardly from the one side of the cap 130 ~~for passing the wires 102 through~~.

A synthetic resin material is filled in the case 110 to cover the circuit printed board 120, and the cap 130 and the light emitting ~~[[diode]]~~ diodes 122. Preferably, the synthetic resin material comprises an epoxy resin.

Hereinafter, the assembled state of the light emitting diode assembly for an illuminated sign according to the preferred embodiment of the present invention as above will be described in detail.

At first, a plurality of light emitting diodes 122 are installed at a plurality of upper sides of the printed circuit boards 120, respectively. ~~A post~~ Ends of the ~~[[wire]]~~ wires 102 ~~[[is]]~~ are fixed at a lower end of the printed circuit board 120 by

means of a solder or a pin structure. ~~[[The]] Both ends of~~ wires 102 are connected to ~~both ends of~~ the printed circuit board 120, ~~respectively~~. The transformer 140 is installed at a lower portion of the printed circuit board 120.

The printed circuit board 120, which is connected to the ~~[[wire]]~~ wires 102 and  
5 the transformer 140, is mounted on the receiving chamber 114 of the case 110. At this time, the ~~[[wire]]~~ wires 102 ~~[[is]]~~ are installed at the case 110 by using the cap 130. That is, each of the wires 102 passes through the guiding pipes 134~~[[. And]]~~, and then, the cap 130 is coupled to the connecting recess 112 of the case 110. The semicircular portion of the lower portion of the cap 130 is inserted into the connecting recess 112,  
10 and then the coupling groove 132 is closely adhered to the edge of the connecting recess 112 of the case 110.

When a worker fills the receiving chamber 114 of the case 110 with synthetic resin such as epoxy resin, the printed circuit board 120~~[[. The]]~~, the epoxy resin covers the transformer 140 and the light emitting diode 122. Accordingly they are not exposed  
15 to the outside of the case 110.

The light emitting diode assembly 100 is installed on the illuminated sign 104 by screw means. The screw means is fixed at the illuminated sign 104 through a screw recess 117 of the connecting bracket 116. The light emitting diode assembly 100, also, may be installed on the illuminated sign 104 by using various adhering materials, such  
20 as an adhesive agent or a double tape instead of the screw ~~[[mean]]~~ means. The light emitting diode assembly 100 may be disposed on the upper side of the illuminated sign 104 in a zigzag shape. The light emitting diode assemblies 100 are connected with each other by using the ~~[[wire]]~~ wires 102.

Under this state, the light emitting diode 122 receives alternating voltage or  
25 direct voltage from the ~~[[wire]]~~ wires 102.

The transformer 140 drops the voltage so that a common alternating current supplied through the wires 102 ~~[[are]]~~ is coincided with or converted to ~~[[a]]~~ the driving voltage of the light emitting diode 122. The rectified circuit transforms the alternating current to direct current voltage. The constant voltage circuit and the constant current



circuit adjust [[a]] the intensity of a direct voltage supplied through the wire so that the direct voltage is coincided with or converted to the driving voltage of the light emitting diode 122.

5 The direct voltage supplied from the wire 102 maintains the voltage for adjusting the direct voltage from the wire 102 to the driving voltage of the light emitting diode 122.

10 As described above, in the light emitting diode assembly for an illuminated sign according to the preferred embodiment of the present invention, it is possible to prevent a wire from shorting when the wire passes through the case by using the cap, which is made PVC. Also, it is possible to prevent the printed circuit board, transformer and the light emitting diode from being damaged by using an epoxy resin. The epoxy resin can cover the printed circuit board, transformer and the light emitting diode.

15 Meanwhile, when alternating voltage is supplied to the printed circuit board, the light emitting diode has a regular luminosity by supplying the voltage to adjust the driving voltage of the light emitting diode from the constant current and the constant voltage. While direct voltage is supplied to the printed circuit board, the light emitting diode has a regular luminosity by supplying the voltage in order to harmonize the driving voltage of the light emitting diode from the constant current and the constant voltage.

20 While the present invention has been particularly shown and described with reference to particular embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as defined by the appended claims.

## LIGHT EMITTING DIODE ASSEMBLY FOR AN ILLUMINATED SIGN

## ABSTRACT OF THE DISCLOSURE

The light emitting diode assembly for an illuminated sign discloses an enhanced ~~waterproofs~~ waterproof function and an enhanced durability. The light emitting diode  
5 assembly includes a case being open upwards, in which a connecting recess is formed on upper portions of both sides of the case. A printed circuit board is installed in the case and being mounted on upper sides of a plurality of light emitting diodes. The hollow cap is coupled in the connecting recess of the case, in which a plurality of wires passes through the cap. A synthetic resin material for covering the printed circuit board,  
10 the cap and the light emitting diode, ~~the synthetic resin material being~~ is filled in the case. In this structure, the light emitting diode assembly can prevent the printed circuit board, transformer and the light emitting diode from being damaged by using an epoxy resin.